CLAIMS

What is claimed is:

1. A method of forming a semiconductor device, comprising:

implanting, on a substrate, a dopant and at least one species; and

annealing said substrate, said at least one species retarding a diffusion of said dopant during said annealing of said substrate.

2. The method of claim 1, wherein a dosage of said at least one species exceeds a preamorphization threshold of said substrate.

3. The method of claim 1, wherein a dosage of said at least one species is at least about 3 times the preamorphization threshold of said substrate.

4. The method of claim 1, wherein a dosage of said at least one species is at least about 5 times the preamorphization threshold of said substrate.

5. The method of claim 1, wherein a dosage of said at least one species is at least about 7 times the preamorphization threshold of said substrate.

6. The method of claim 1, wherein said at least one species damages a junction formed by the dopant.

7. The method of claim 6, wherein said junction has a thickness of no more than about 30 nm.

8. The method of claim 6, wherein said junction has a slope which is at least about 5 nm per decade of change in concentration of said dopant.

9. The method of claim 1, wherein said substrate comprises at least one of silicon, SiGe, strained Si and strained SiGe.

10. The method of claim 1, wherein said at least one species comprises at least one of Xe, Ge, Si, Ar, Kr, Ne, He and N.

11. The method of claim 1, wherein said dopant comprises at least one of As, P, and Sb.

12. The method of claim 1, wherein said dopant is implanted at a time which is one of prior to said implanting said species, and after said implanting said species.

13. The method of claim 1, further comprising:

forming a source and drain region in said substrate; and

forming a metal silicide contact over said source and drain region.

14. The method of claim 13, wherein said source and drain region are formed at a time which is prior to said implanting of said dopant.

15. The method of claim 13, wherein said source and drain region are formed at a time which is after said implanting of said dopant.

16. The method of claim 14, wherein said dopant is implanted at a time which is one of prior to said implanting said species, and after said implanting said species.

17. The method of claim 15, wherein said dopant is implanted at a time which is one of prior to said implanting said species, and after said implanting said species.

18. The method of claim 1, wherein said species is implanted at least about 10 to about 20 nm deeper than said dopant.

19. The method of claim 1, wherein said species has an implantation energy sufficient to create a region surrounding at least a portion of an extension region in said substrate.

20. The method of claim 1, wherein said species has a first implantation energy sufficient to create a region surrounding at least a portion of an

extension region in said substrate, and a second implantation energy sufficient to create a region surrounding at least a portion of a source/drain region in said substrate.

21. The method of claim 1, wherein said species has an implantation energy sufficient to create a region surrounding at least a portion of an extension region and at least a portion of a source/drain region in said substrate.

22. The method of claim 1, wherein said annealing said substrate is performed after said implanting said dopant and said implanting said species.

23. The method of claim 1, wherein said implanting said dopant is performed after said implanting said at least one species, said method further comprising:

annealing said substrate after said implanting said species and before said implanting said dopant.

24. A method of forming a shallow and abrupt junction in semiconductor substrate, comprising:

implanting a dopant on a substrate;

implanting at least one species in a vicinity of said dopant in a dosage which far exceeds a preamorphization threshold of said substrate; and

annealing said substrate, said at least one species retarding a diffusion of said dopant during said annealing of said substrate, such that a shallow and abrupt junction is formed.

25. A semiconductor device, comprising:

a semiconductor substrate;

a dopant formed in said substrate, to define a junction; and

a species formed in a vicinity of said junction and in a concentration which far exceeds a preamorphization threshold of said substrate.

26. The device of claim 25, further comprising:

a source region and a drain region formed adjacent said dopant and said species;

a channel formed between said source and drain regions;

a gate formed over said channel; and

a contact formed over said source and drain regions.

27. The device of claim 26, wherein a region of said species surrounds at least a portion of said junction.

28. The device of claim 26, wherein a region of said species surrounds at least a portion of said junction, and at least a portion of said source and drain regions.

29. The device of claim 25, wherein said junction has a thickness of no more than about 30 nm, and a slope which is at least about 5 nm per decade of change in concentration of dopant.

30. The device of claim 25, wherein said substrate comprises one of silicon, SiGe, and strained Si.

31. The device of claim 30, wherein said SiGe comprises one of relaxed SiGe and strained SiGe.

32. The device of claim 31, wherein said strained SiGe comprises SiGe under one of a compressive strain and a tensile strain.